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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,988	07/14/2003	Chang Jin Ko	29936/39479	5970

4743 7590 03/29/2004

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EXAMINER

OWENS, BETH E

ART UNIT	PAPER NUMBER
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2824

DATE MAILED: 03/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/618,988

Applicant(s)

KO, CHANG JIN

Examiner

Renee R Berry

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 6,566,260 to Chooi et al. in view of US Patent No. 6,413,879 to Maeda.

In regards to claim 1, Chooi teaches a method of forming a barrier in a semiconductor device, comprising the steps of: a) patterning a film on a base layer to form a via hole at column 5, lines 65-67 to column 6, lines 1-4.

In regards to claim 2, Chooi teaches step (b) depositing CVD TiN on the entire structure including the via hole; implementing a plasma treatment process using N<sub>2</sub> + H<sub>2</sub>; and repeatedly implementing the deposition process at column 10, lines 6-22.

In regards to claim 3, Chooi teaches the CVD TiN film is formed in thickness of 10 - 20Å at column 6, lines 1-2.

In regards to claim 4, Chooi teaches a method of forming a barrier in a semiconductor device, a) patterning a porous film on a base layer to form a via hole; b) depositing a CVD TiN film on the entire structure including the via hole; c) implementing a plasma treatment process using N<sub>2</sub> + H<sub>2</sub>; d) repeatedly implementing the steps (b) and (c) in order to bury only the pores formed on the surface of the porous film with

CVD TiN; and e) forming a barrier on the entire structure including the via hole at column 10, lines 48-64, claim 1.

In regards to claim 5, Chooi teaches CVD TiN film is formed in thickness of 10 - 20A at column 6, lines 1-2.

In regards to claim 6, teaches a method of forming a barrier metal in a semiconductor device, comprising the steps of: a) patterning a film on a base layer to form a via hole; b) repeatedly implementing a process of depositing a TiN film at column 10, lines 48-64, claim 1.

However, Chooi does not teach all the limitations of the claims.

In regards to claims 1 and 6, Maeda teaches b) burying pores of the sidewall of the via hole with a CVD TiN film; and c) forming a barrier metal on the entire structure including the via at column 30, lines 26-33

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified Chooi to include burying pores of the sidewall of the via hole with a CVD TiN film; and forming a barrier metal on the entire structure including the via, since such a modification would result in good heat resistivity and moisture absorption as described in column 14, lines 1-5.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US Patent No. 6,645,864 to Lin et al. discloses a method of forming a barrier metal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Renee R Berry whose telephone number is (571) 272-1774. The examiner can normally be reached on M-F 9-5:30.


The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*RRB*

RRB

February 14, 2004

  
David Nelms  
Supervisory Patent Examiner  
Technology Center 2800